Ecology, 81(6), 2000, pp. 1757–1758

METAPOPULATIONS AND ECOLOGY

Hanksi, Ilkka. 1999. **Metapopulation ecology**. Oxford Series in Ecology and Evolution. Oxford University Press, New York. ix + 313 p. $85.00 (cloth), ISBN: 0-19-8540663-3; $45.00 (paper), ISBN: 0-19-854065-5.

The revival of interest in metapopulation biology over the past 10–15 years has inspired several edited volumes that have provided key insights and summaries of the burgeoning literature. Until recently, however, metapopulation biology lacked an authoritative and synthetic monograph. *Metapopulation ecology*, by Ilkka Hanski, stands alone as the source for anyone with a beginning interest and a standard reference for practitioners.

Because metapopulation biology has grown so rapidly in so many directions, a comprehensive review of the field in an imposing task. The primary aim and greatest strength of *Metapopulation ecology* is synthesis. Hanski emphasizes in the prologue that ''. . . our task is not so much to classify species into one or another category . . . the real question is whether a *metapopulation approach* is useful . . . .'' Clearly this is a theme that pervades ecology, as Hanski emphasizes further in a brief introductory review of classical population and community ecology, and the relevance of metapopulation perspectives prior to coining of the term by Richard Levins in the late 1960's.

Hanski attempts to draw several traditionally separate ends of various continua closer together: empirical and theoretical approaches; basic and applied questions; single species metapopulations and metacommunities; ecology and evolutionary biology. Throughout the book, there are parallels between metapopulation theory and developments in other fields, especially epidemiology. A broad view is needed because metapopulation biology is a field that is far too young to be set in its ways.

Another important aspect of the book is that Hanksi permits himself to comment candidly on many aspects of metapopulation ecology. Such insights are rarely permitted (at least overtly) within the cover of peer-reviewed journals, and individual book chapters are often too short to provide more than a fleeting glimpse of an author's personal perspectives. This style of presentation breathes life into the detailed technical aspects of metapopulation ecology, and of course provides much fodder for discussion and future research.

Each of the topics covered in *Metapopulation Ecology* would merit a separate volume, and many details are left to more specialized sources. The several hundred (I estimate at around 900) up-to-date literature citations should prove sufficient to satisfy the curiosity of those interested in further detail. The book is divided into three major parts covering theory, field study, and a case study of the Glanville fritillary.

In Part I, the chapters begin with relatively simple two-population and Levins metapopulation models, and then to incidence function, state transition, and *n*-population models. Basic concepts are described mathematically, and generally accompanied by a relatively clear verbal or graphical description for the less mathematically inclined. The emphasis is on general aspects of model behavior and implications for understanding natural phenomena. Two additional chapters in Part I briefly cover theoretical aspects of evolutionary and community ecology in the context of metapopulations.

Part II describes field studies in the context of theory, and applications to problems in conservation. This section is notably shorter than coverage of theory, and reflects the general lack of good empirical data to test ideas from metapopulation theory especially for vertebrates and plants. Hanski does not exhaustively review every potentially relevant field study. Instead, the focus is on examples with relatively unequivocal results (when available at all). Examples cover many topics, including spatial structuring of habitat and populations, evidence for turnover, influences of movement, and source-sink dynamics. Evidence for mechanisms to explain the relationship between the distribution and abundance of species and the core-satellite hypothesis are given particular attention. Part II finishes with a review that highlights key contributions of metapopulation theory to conservation, with examples from birds, mammals, butterflies, and plants.

Part III describes the case of the Glanville fritillary, a butterfly that Hanksi and his colleagues have studied as a model organism to apply and test ideas from metapopulation theory. This species has influenced metapopulation ecology more than any other. The case of the Glanville fritillary includes fascinating details of natural history, species interactions, and metapopulations dynamics of associated parasitoids. Part III finishes with a chapter that reviews example applications of

Hanski's incidence function model to a variety of species (especially butterflies) and situations, including ''classical'' metapopulations and those with transient dynamics or multiple equilibria. The examples make a compelling case for wider application of his approach.

Readers of *Metapopulation ecology* who are not inclined to work on butterflies may feel left behind. They should also feel challenged to more rigorously apply ideas from metapopulation theory to better understand the biology of their organisms or communities (and vice-versa). Whether or not you've read other recent volumes in the field, *Metapopulation ecology* will provide a fresh and synthetic view of the rich insight that metapopulation theory can offer. This book represents an important milestone by one of the undisputed gurus of the field, and belongs not on the shelf, but in the hands of any practicing or prospective metapopulation biologist.

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